

system towards or away from the isocentre position, which is defined by the isocentre of the MRI scanner. The rail system enables the linatron to be placed at 8 different positions from the linatron ranging from a SSD of 190-336cm. To verify alignment of the radiation beam for the different linac rail positions, radiation profiles were acquired in air at different distances from the target. From the profiles the central axis position (CAX) was used to establish the alignment of the radiation beam. To verify MLC alignment to the CAX without the ability to rotate the collimator, a series of half blocked fields were used, with abutting fields and picket fence tests used to verify positional accuracy. Standard scanning water tank systems can not be used within the MRI scanner due to both ferromagnetic components and lack of physical space. To enable a comparison of baseline data once the magnet is installed, water dosimetry measurements were compared with measurements within an adjustable solid water phantom.

Results: CAX measurements were successfully used to establish the alignment of the radiation beam for different linac positions. The reproducibility of the central position of the radiation beam was within 2 mm for all positions and the radiation beam alignment for all positions was within 0.5 degrees, demonstrating that the radiation beam was horizontal and not misaligned within that plane. MLC alignment was within 0.5mm of the CAX beam position at a source to surface distance (SSD) of 100cm and within 6.5mm at a SSD of 277cm. The solid water phantom set-up achieved comparable dosimetry with the water tank set-up, enabling future measurements to be undertaken safely within the confines of the MRI scanner.

Conclusion: We have developed a generalised methodology appropriate for the commissioning a fixed radiation therapy beam line. We have taken baseline (no magnetic field) alignment and dosimetry measurements for the AMP beamline, demonstrating that the rail system and MLC alignment are within tolerance. We have also demonstrated the equivalency of a solid water approach with a conventional water tank enabling future dosimetry measurements within the MRI scanner.

Poster: Physics track: Professional and educational issues

PO-0952

Blended teaching reduces interobserver contouring variability: first results of the FALCON project
B. De Bari¹, C. Salembier², M. Palmu³, S. Rivera⁴, J. Eriksen⁵, S. Kaylor⁶, A. Boyler⁶, C. Verfaillie⁷, V. Valentini⁷

¹Centre Hospitalier Universitaire Vaudois, Department of Radiation Oncology, Lausanne Vaud, Switzerland

²Europe Hospitals, Department of Radiation Oncology, Brussels, Belgium

³European Society for Radiation and Oncology, ESTRO, Brussels, Belgium

⁴Institut Gustave Roussy, Department of Radiation Oncology, Paris, France

⁵Odense University hospital, Department of Oncology, Odense, Denmark

⁶RadOnc, eLearning Center- Inc., Fremont- CA, USA

⁷Catholic University, Department of Radiation Oncology, Rome, Italy

Purpose or Objective: Interobserver contouring variability is one of the most important sources of uncertainty in radiotherapy. Blended learning techniques are formal educational programs in which students learn, at least in part, through delivery of content and instruction via digital and online media with some element of student control over time, place, path, or pace. In 2009, ESTRO launched the FALCON (Fellowship in Anatomic deLineation and COntouring) project. This web-based project aims at the improvement of the skills and homogeneity in contouring among professionals and/or trainees in the field of radiation oncology by organizing live and online contouring workshops. This study

reports the first results of interactive teaching during live workshops.

Material and Methods: We analyzed the contours of 66 participants to 2 live FALCON workshops and covering 2 clinical situations: the contouring of prostate cancer (35 participants) and the contouring of some Organs At Risks (OARs - brachial plexus, esophagus, trachea and proximal bronchial tree, 31 participants). In all the analysed workshops, delineations were done before and after interactive teaching. Variability of clinical target volumes (CTVs) contoured by participants and the impact of teaching courses was evaluated using the DICE indexes. Moreover, for the prostate case, 3 sub-regions were retrospectively identified and analyzed separately: the prostate base (upper 5 slices, total length: 1 cm), the mid-prostate (following 15 consecutive slices) and the prostate apex (five lower slices, total length: 1 cm).

Results: Table 1 summarizes data of the 2 workshops. Mean CTV DICE indices for the workshops ranged overall from 15% to 84.1% before the teaching lecture, and from 23.4% to 86.1% after teaching, but with large interobserver variations. Usually, a significant improvement in delineation was observed on DICE indices among participants compared to experts' delineations after the teaching lecture (two-tailed t-test P value ranging between 0.04 and <0.001). An improvement was also noted at a more qualitative analysis, with the contours being much more homogeneous amongst participants after teaching.

STRUCTURE	AVERAGE PRE TEACHING DICE (%)	AVERAGE POST-TEACHING DICE (%)	AVERAGE DIFFERENCE (%)	P-VALUE
WHOLE PROSTATE	84.1	86.1	+2	<0.0001
PROSTATE BASE	57.3	68.9	+11.6	<0.0001
MID-PROSTATE	88.3	89.3	+1%	0.01
PROSTATE APEX	48.5	50.3	+1.8	0.35
TRACHEA AND PROXIMAL BRONCHIAL TREE	73.3	76.4	+2.1	0.33
OE SOPHAGUS	65.1	77.1	+12	0.1
BRACHIAL PLEXUS	15	23.4	+8.4	0.03

Conclusion: Evaluation of the immediate impact of teaching contouring is feasible and FALCON teaching methods reduce interobserver variability in CTV delineation at workshops. ESTRO is strongly committed in the further development of the current and of the future live and online FALCON workshops. The long-term impact of the FALCON workshops will be further evaluated in the context of well designed ad hoc research projects.

Poster: Brachytherapy track: Breast

PO-0953

Intraoperative multicatheter implant for APBI or boost in conservative surgery of breast cancer

M. Cambeiro¹, F. Regueira², N. Rodriguez-Spiteri², B. Olartecoechea³, J. Idoate⁴, L. Pina⁵, R. Martinez-Monge¹

¹Clinica Universitaria de Navarra, Radiation Oncology, Pamplona, Spain

²Clinica Universitaria de Navarra, General Surgery, Pamplona, Spain

³Clinica Universitaria de Navarra, Gynecology, Pamplona, Spain

⁴Clinica Universitaria de Navarra, Pathologist, Pamplona, Spain

⁵Clinica Universitaria de Navarra, Radiologist, Pamplona, Spain

Purpose or Objective: To assess the safety, feasibility and efficacy of free-hand intra-operative multi-catheter breast implant and peri-operative high-dose rate brachytherapy (FHIOMBI-PHDRBT program) in early breast cancer treated by breast conservative surgery (BCS).

Material and Methods: Patients with early breast cancer who were candidates for BCS and potential accelerated partial breast irradiation (APBI) were prospectively enrolled for the FHIOMBI-PHDRBT program. Patients suitable for APBI received PHDRBT (3.4 Gy BID for 10 in five days). Patients not suitable for APBI received PHDRBT as anticipatory boost (3.4 Gy BID for 4 in two days) followed by whole breast irradiation (WBI).

Results: From November 2008 to January 2015, a total of 119 patients were treated and 122 FHIOMBI procedures were performed. Median duration of FHIOMBI was 25 minutes. A median of 8 catheters (range 4-14) were employed. No intraoperative complications were observed. Severe early postoperative complications (bleeding) were documented in 2 patients (1.6%), wound healing complications in 3 (2.4%), and infection (mastitis or abscess) in 2 (1.6%). Late mammogram follow-up revealed oil cysts in 56% of patients but symptomatic fat necrosis in only 2 patients (1.6%). PHDRBT was delivered as APBI in 88 patients (74%) and as a boost in 31 (26%). The median CTV-T was 40.8 cc (range 12.3-160.5), median D90 of 3.32 Gy (range 3.11-3.85), median DHI 0.72 (range 0.48-0.82) median D10 in high-risk skin zone 1.94 Gy (range 0.92-3.37). With a median follow-up of 35 months (range 5.9-80.9) in the whole group and 37.7 months (range 7.6-80.9) in APBI patients, no local, elsewhere or regional failures were observed, only one distant failure in PHDRBT boost was documented. Cosmetic outcomes were evaluated in APBI patients as excellent (42.0%), very good (46.0%), fair (10.0%) or poor (2.0%).

Conclusion: The FHIOMBI-PHDRBT program does not add complications to conservative surgery, it adapts to breast size and location of the tumor, fulfilling at the same time prescription requirements and constraints. It allows an exquisite selection of APBI patients and offers excellent results in disease control and cosmetics. It also offers logistic advantages as it dramatically shortens the time of local treatment and avoids further invasive procedures.

PO-0954

Early results of a multi-center trial of IORT using electronic brachytherapy for breast cancer

P. Costa¹, A.M.N. Syed², H. Chang³, B. Schwartzberg⁴, A. Bremner⁵, S. Boylan⁶, C. Lopez-Penalver⁷, C. Vito⁸, M. Davis⁹, W. Dooley¹⁰, A.B. Chakravarthy¹¹, C. Coomer¹², G. Proulx¹³, S. Golder¹⁴, O. Ivanov¹⁵, K. Fernandez¹⁶, M. Farha¹⁷, V. Gonzalez¹⁸, A. Bhatnagar¹⁹, G. Neuner²⁰, K. Kopkash²¹, S. Rahman²², C. Corn²³

¹Instituto CUF, Radiation Oncology, Porto, Portugal

²Long Beach Memorial Medical Center, Todd Cancer Institute, Long Beach, USA

³UCLA, Revlon Breast Center, Los Angeles, USA

⁴Rose Medical Center, Sarah Cancer Research Institute, Denver, USA

⁵Breastlink, Surgical Oncology, Murietta, USA

⁶Sentara Northern Virginia, Radiation Oncology, Woodbridge, USA

⁷Doctors Hospital, Oncology, Miami, USA

⁸City Of Hope National Medical Center, Surgical Oncology, Duarte, USA

⁹Swedish Medical Center, Radiation Oncology, Englewood, USA

¹⁰Oklahoma University, Surgery, Oklahoma City, USA

¹¹Vanderbilt University, Radiation Oncology, Nashville, USA

¹²Staten Island University Hospital, Comprehensive Breast Center, Staten Island, USA

¹³Exeter Hospital, Radiation Oncology, Exeter, USA

¹⁴Parkridge Medical Center, Shannon Cannon Cancer Center, Chattanooga, USA

¹⁵Florida, Department of Surgery, Orlando, USA

¹⁶MedStar Health, Breast Center, Baltimore, USA

¹⁷MedStar Health, Breast Center, Baltimore MD, USA

¹⁸University of Arizona, Radiation Oncology, Tucson, USA

¹⁹Cancer Treatment Services, Radiation Oncology, Casa Grande, USA

²⁰Greater Baltimore Medical Center, Radiation Oncology, Baltimore, USA

²¹Rush University, Surgery, Chicago, USA

²²Diablo Valley Oncology Hematology Medical Group, Radiation Oncology, Pleasant Hill, USA

²³Phoenix Baptist Hospital, Department of Surgery, Phoenix, USA

Purpose or Objective: To describe early observations of a multi-center study utilizing a single fraction of intra-operative radiation therapy (IORT) using the Xofigo® Axcent® Electronic Brachytherapy System® (eBx®) immediately following surgical resection of early stage breast cancer.

Material and Methods: 727 subjects have been treated at 25 hospitals. Upon meeting entry criteria, patients underwent partial mastectomy. While in the operating room a balloon applicator was placed in the lumpectomy cavity and inflated with saline (30-75 cc). The skin was closed over the balloon, a balloon surface-to-skin distance of >1.0 cm was confirmed, and a single fraction of IORT was delivered to the lumpectomy cavity. The prescribed dose was 20 Gy at the balloon applicator surface; the mean treatment time was 10.3 minutes. After treatment, the balloon was deflated and removed, and skin sutured.

Results: 726 subjects received the prescribed dose of 20 Gy; one received 21 Gy. 56 are removed from the primary analysis post-IORT due to subsequent whole breast irradiation (N=37), positive lymph nodes (N=7), positive surgical margins (N=4), re-excision (N=4), inadequate skin bridge (N=2), inadequate balloon conformance (N=1), and other (N=4). These subjects will be followed for the duration of the study. An additional 60 subjects have withdrawn, leaving 667 active subjects. The mean patient age is 65 years (44-88). 148 subjects (20%) had ductal carcinoma in situ, 550 (75%) had invasive ductal carcinoma, 28 (5%) were unknown. DCIS nuclear grade was high (N=55), intermediate (N=64) and low (N=27); 2 were unknown. Invasive cancer was Grade 1-2 in 465/550 cases. 93% (N=676) had T1 lesions, 7% (N=51) had T2 lesions. Mean tumor size is 10.53 mm ± 8.3 mm. Mean follow-up is 336 days (4-1096). Only 125/926 (13.5%) of the reported adverse events were Grade 2 or higher. The most frequent AEs are seroma (15.4%), breast pain (14.1%), erythema (10.7%), and induration (8.5%). Cosmesis was excellent-to-good in over half (65%) of the cases. There have been six (6) deaths (aortic aneurysm; heart attack; pneumonia; liver cancer; 2 unknown causes) and only one (1) recurrence reported to-date.

Conclusion: IORT using the Xofigo System as part of the conservative treatment of breast cancer is safe, with low morbidity. Early results from this multi-center trial demonstrate this short, convenient course of radiation therapy for select patients with early stage breast cancer has excellent-to-good cosmetic results and a low rate of low-grade adverse events.

PO-0955

PBI with interstitial HDR brachytherapy: acute and late toxicities & cosmetic results.

V. Carboneschi¹, M. Mignogna², S. Linsalata³, M. Mignogna¹

¹Ospedale San Luca, Radioterapia, Lucca, Italy

²Student Of Medicine, University, Pisa, Italy

³Ospedale San Luca, Fisica Sanitaria, Lucca, Italy

Purpose or Objective: Purpose: The study we report is for early stage breast cancer and is a multicentre clinical investigation of PBI achieved by interstitial HDR brachytherapy with intraoperative placement of catheters.